

## **Predicting Impacts of Environmental Change: Modeling Estuarine & Coastal Ecosystem Dynamics**

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Integrated modeling systems which consist of coupled models of physical, biogeochemical, and ecological processes have been developed recently to simulate the ecosystem dynamics in estuarine and coastal waters of Florida. The first modeling system is based on the new-generation CH3D (Curvilinear-grid Hydrodynamics 3-D) model, and include a wave model, a sediment transport model, a water quality model, a light attenuation model, and a seagrass model. Novel numerical aspects of the new-generation CH3D and the integrated modeling system, CH3D-IMS, including high-performance modeling, will be briefly presented. The modeling system has been validated with extensive data and applied to simulate the response of Tampa Bay, Charlotte Harbor, and Indian River Lagoon to anthropogenic and natural changes. Dynamics of planktons and various (dissolved and particulate, inorganic and organic) forms of nutrients over various time scales ranging from episodic events to annual variability have been simulated. Wave-reduced resuspension of sediments and nutrients has been found to play a major role in affecting the distribution and budget of various water quality parameters. The modeling system is being used by Florida resource managers to determine the allowable pollutant loading into various watersheds of the Indian River Lagoon. The modeling system has also been used to successfully simulate the movement of clam larvae in Indian River Lagoon. The modeling system is being expanded to include surface water and ground interaction as well as transport processes of contaminants (metals and organics). This modeling system can be used to assist the coastal monitoring and assessment activities of NOS. Another integrated modeling system for predicting storm surge and coastal flooding will also be briefly presented.